Figure 73 A four-wheeler crossing site near the Forest boundary. Four-wheelers have impacted the lower portions of the stream.

East Fork Hotel Creek

Figure 74 East Fork Hotel Creek

East Fork Hotel Creek near the Forest boundary in Section 36, Township 14 North, Range 42 East. Flow is about 1 cfs. Bankfull width is ~ 5 feet. Bankfull depth is ~ 1 foot. The channel has downcut several feet. There is a heavy sand/gravel bedload, with embeddedness nearly 100% in pools and over 50% in riffles.

Figure 75 East Fork near the Forest boundary in section 2, Township 13 N, Range 42 E.

Figure 76 ATV crossing on west fork Hotel creek.

A make-shift bridge has been placed across the stream channel (Figure 76). The non-system trail parallels the stream for nearly a mile at the lower end of the reach

Hotel Creek

Figure 77 Hotel Creek

Hotel Creek about ½ mile above the West Fork confluence. Bankfull width is ~ 4 feet. Bankfull depth is ~ 0.5 ft. Flow is about ¼ cfs. The channel type is primarily a C4, with inclusions of E4.

Figure 78 Hotel Creek at the West Fork confluence. Note the sand bar (left side of photo) being transported down West Fork.

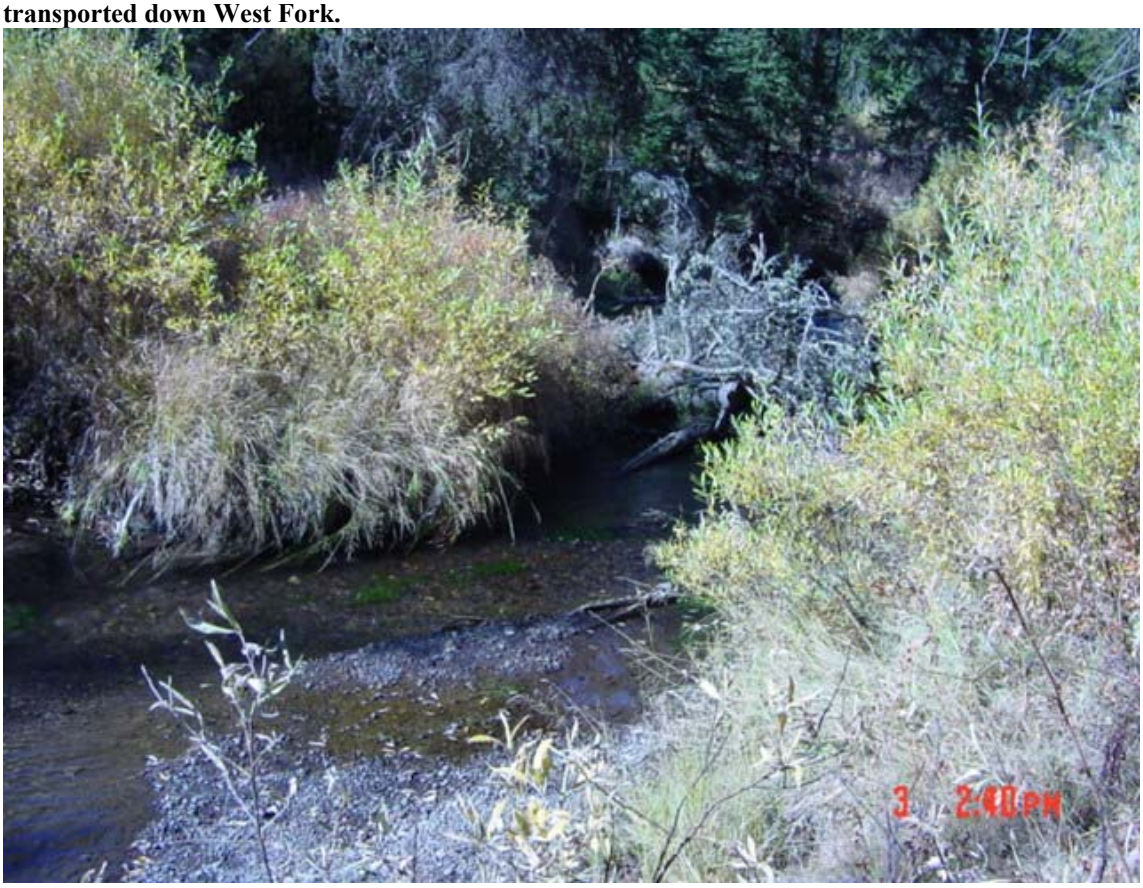


Figure 79 Hotel Creek at the East Fork Confluence.

Figure 80 Hotel Creek about ½ mile below the Forest boundary. Bottom substrate is predominately sands and gravels.

Vegetation

Structure

The forest vegetation of the assessment area is dominated by dense, late seral to climax communities. Greater than 90% of the Douglas-fir, mixed conifer, other mixed conifer, aspen, and spruce-fir cover types are in the mature age classes (this includes old growth and late seral structures). Lodgepole pine however, has a lower percentage with only 56% of this cover type in the mature age class. Only 13% of the forest vegetation is in early successional stages which is predominantly found in the lodgepole pine cover type (see Table 16).

Table 16 Forest Cover Types and Structure by Cover Type in the Blue Creek Assessment Area

Cover Type	Nonstocked		Seedling		Sapling		Pole		Mature		Previous Harvest		Total Acres
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	
Lodgepole	1274	8%	3014	18%	1504	9%	1579	9%	9347	56%	0	0%	16719
Douglas-fir	20	0%	142	2%	13	0%	13	0%	6557	96%	81	1%	6826
Mixed DF/LP	28	0%	5	0%	0	0%	0	0%	7078	100%	0	0%	7112
Other Mixed	0	0%	83	2%	0	0%	102	2%	4570	96%	0	0%	4755
Aspen	0	0%	0	0%	0	0%	15	1%	1623	99%	0	0%	1638
Subalpine/Whitebark pine	0	0%	0	0%	0	0%	0	0%	176	100%	0	0%	177
Total Acres and % Area by Structure	**1321**	**4%**	**3243**	**9%**	**1517**	**4%**	**1709**	**5%**	**29351**	**79%**	**81**	**<1%**	

Old Growth and Late Seral Forest

Old Growth forest is an important component of biological diversity. In 1993, the Intermountain Region completed a report on the characteristics of old growth forests in the Intermountain Region. More description about old growth characteristics can be obtained from this report. Currently, the area does not have a complete inventory of old growth forest. However, 412 permanent forest inventory plots are established across the Targhee portion of the forest. Of these, 3 plots are within the assessment area and have the characteristics of old growth. Majority of these plots are located in the Douglas-fir cover type. Based on these plots, and other NEPA analysis located in the Centennial Mountains, the highest probability of old growth and late seral stands would be found in the Douglas-fir and mixed conifer cover types.

Lodgepole

This cover type can be described as pure stands of lodgepole pine. In localized areas small aspen patches can be found. Some Douglas-fir and subalpine fir seedling/saplings can be found in the understory when favorable soil and site conditions exist for these species.

Current Condition

There are 16,719 acres or 45% of the forested vegetation is lodgepole pine cover type. Presently, the lodgepole pine is concentrated in the seedling/sapling (35% including non-stocked) and mature (56%) age classes with little representation in the mid-aged or pole size (9%) classes. Majority of the seedling/sapling age classes are due to the harvest in the 1960's and 1970's related to the mountain pine beetle epidemic. The majority of these areas were naturally regenerated or planted in the 1980's to the early 1990's. Some these areas also have localized areas of aspen regeneration. The average patch sizes of these areas are approximately 40 acres. In some of these stands site productivity may have been compromised due to machine piling techniques and soil surface stripping. The mature age class is result of stand replacing fires that occurred 100 to 200 years ago and were not harvested.

Typically, mountain pine beetle epidemics occur in 80 to 120 year old stands. Lodgepole pine greater than 8 inches in diameter, and 80 years of age are the most susceptible to mountain pine beetle attack. Today, there is little mountain pine beetle activity in the lodgepole pine. Some small localized overstory mortality has occurred and has opened holes in the canopy allowing regeneration to establish. Most of the regeneration is lodgepole pine, however, Douglas-fir and subalpine fir regeneration can be found on sites more mesic and out of cold air drainages and/or frost pockets. Dwarf mistletoe is present in the mature stands. Regeneration establishing in the understory of these stands is being infected by mistletoe in the overstory. Growth losses can be significant with this parasite.

Mixed Douglas-fir/Lodgepole

This cover type can be described as a mixture of Douglas-fir and lodgepole pine. Douglas-fir and lodgepole pine could be described as clumpy distribution across the cover type area. Aspen occurs in small patches throughout the area.

Current Condition

There are 7,111 acres (19%) of the forested vegetation assessment area is in the mixed Douglas-fir/lodgepole type. Factors such as disturbance history, site specific characteristics, and successional trends add complexity to the distribution and mixture of tree species. In the portions of the cover type not significantly impacted by major disturbance events such as timber harvest and fires, many of these stands have become denser and multistoried with a higher percentage of Douglas-fir.

Most of this cover type is mature stands. Only a trace amount of this cover type is in the seedling/sapling stages. Douglas-fir component is dominated by large (>14" DBH) trees. Average Douglas-fir tree ages range from 100-200 years old. Lodgepole pine is mainly pole sized in most stands. Most of the mature lodgpole pine are dead due to localized outbreaks. Densities of the stands are fairly high ranging from 100 to 180 basal area. Aspen can be found but only in very small patches due to conifer encroachement.

Most stands are at moderate risk to Douglas-fir beetle (*Dendroctonus pseudotsugae*). Small individual pockets of Douglas-fir mortality is scattered throughout the cover type. Since Douglas-fir is intermixed with lodgepole pine large mortality pockets are not typically found. Most stands are at low risk to mountain pine beetle.

Douglas-fir and Other Mixed Conifer

This cover type can be described as pure Douglas-fir stands in the lower elevations and southerly aspects of the cover type grading into a higher percentage of subalpine fir, Engelmann spruce, and lodgepole pine in the higher elevations and northerly aspects. Patches of aspen are found scattered throughout the cover type.

Current Condition

This cover type consists of 6,825 acres (18%) of pure Douglas-fir stands and 4,754 acres (13%) in other mixed conifer. Due to classification some of the mixed conifer acres could be a transition into the subalpine cover type. These would be limited to the higher elevations and northerly aspects. Most of this cover type is dense and greater than 90% of the cover type area is in the mature class. In the predominantly Douglas-fir stands, structures are usually single storied with relatively few seedlings and saplings. There are limited amounts of older trees greater than 200 years of age. In the higher elevations or other mixed conifers is multistoried, with Douglas-fir as the overstory and subalpine fir, Engelmann spruce, and lodgepole pine in the sapling to pole size understory. In the aspen patches Douglas-fir is encroaching and out competing aspen.

The majority of the Douglas cover type stands are at high risk and susceptibility to the Douglas-fir beetle. Stands are dense, a high percentage of Douglas-fir, and majority of the trees are large (> 14" DBH). Currently, there is approximately 2,500 acres of large scale mortality within the assessment area due to the Douglas-fir beetle. Douglas-fir beetle populations are high. The drought of the last several years may has resulted in stressed tree conditions. The stage is set for larger areas of mortality within the assessment area. In stands that are at high risk, 70-80% mature Douglas-fir mortality could occur. Currently, there is a western spruce budworm outbreak occurring within the

assessment area. This outbreak will only exacerbate the outbreak of Douglas-fir beetle due to further stress to Douglas-fir trees. The western spruce budworm outbreak started in 2001 and has increased substantially throughout the area.

Aspen

This cover type can be described as being dominated by aspen. Large patches would be found in the lower elevations next to non-forest cover types with smaller patches intermixed with conifers in the higher elevations. Structure could be described as clumpy even aged distribution with a closed canopy.

Current Condition

Currently the aspen cover type occupies 1,637 acres (4%) of the forested vegetation in the assessment area. This is amount of acreage is lower than what would be expected under a natural disturbance regime in the assessment area. Majority of the aspen stands are mature ranging in ages between 60-100 years old. With the majority of aspen stands in the mature age class root, stem, and leaf diseases are common and slowly contributing to the death of mature aspen and reducing the vigor of aspen suckering. Aspen regeneration is limited in most of the assessment area due to the lack of fire to stimulate root suckering. Encroachment of conifers, such as Douglas-fir and subalpine fir is common in most aspen stands and slowly converting aspen sites to a conifer dominated forest. Fire return intervals in these types are longer today than compared to historical averages. Past grazing practices probably have played a critical role in preventing surface fires in aspen stands due to the removal of fine fuels necessary to carry a fire.

Subalpine/Whitebark Pine

This cover type can be described as a clumpy distribution and composition of whitebark pine, limber pine, subalpine fir and Engelmann spruce. There is a higher component of subalpine fir and Engelmann spruce on the more mesic and northerly aspects. This cover type is located at the highest elevations near timberline along the continental divide within the assessment area.

Current Condition

This cover type is a minor component of the forested vegetation in the assessment area (<1%). Part of these acres could be included in the other mixed conifer cover type. Currently, the majority of this cover type is in the mature structure stage. Majority of these stands are in late seral conditions. Subalpine fir and Engelmann spruce are slowly out competing whitebark pine for limited resources. Currently, most of the whitebark pine in the area are infected with white pine blister rust (*Cronotarium ribicola*). White pine blister rust is a non-native disease that was introduced to the United States in the early 1900's. This rust causes cankers and can cause mortality in many infected individuals. Mountain pine beetle is active in many of these stands causing widespread mortality. Competition from other conifers and blister rust is causing it to be more susceptible to the mountain pine beetle.

Disturbance

Disturbances are processes or events that alter landscapes at multiple scales. Fire, insects, disease, and human disturbances have all affected the Blue Creek Watershed Assessment area and continue to do so. In the recent past, the majority of disturbances have been related to timber harvest and insect outbreaks. These disturbances primarily occurred within the lodgepole, and mixed Douglas-fir/lodgepole pine cover types. Approximately 6,162 acres or 16% of the forested vegetation has been disturbed through timber harvest through the 1960's to 1980's. Recently, insect outbreaks of Douglas-fir beetle have affected approximately 2,500 acres. This is approximately 18% of the mixed Douglas-fir/Lodgepole and Douglas-fir cover types. However, these disturbances are still a relatively small percentage of the forested vegetation. This has resulted in landscape dominated by mature, dense, vegetation which is susceptible to large scale disturbances.

Insects and Disease

Several insects and diseases have stood out in altering the Blue Creek Watershed Assessment area. Mountain pine beetle is the most important disturbance agent in lodgepole pine. Douglas-fir beetle and western spruce budworm are the most important agent in Douglas-fir. The most significant and destructive disease in the assessment area is white pine blister rust. This disease is having a profound affect on the whitebark pine in the assessment area causing significant mortality. In aspen, various insects and diseases are normal components, including canker diseases, stem, root, and butt decays. Dwarf-mistletoe is in the area mainly affecting lodgepole pine. However, it is not a major disturbance agent within the assessment area. Mountain pine beetle, western spruce budworm, and white pine blister rust will be discussed below.

Mountain Pine Beetle

The mountain pine beetle is the most significant natural mortality agent of mature lodgepole pine. However, it is causing significant mortality in whitebark pine. Generally, mountain pine beetle prefers larger diameter (>8" DBH) lodgepole pine or whitebark pine with thick phloem. Endemic populations are always present, breeding in scattered mature trees. Outbreaks generally occur when large areas of suitable large diameter lodgepole pine are present. After the larger trees are killed smaller and smaller trees are infected. These types of trees have smaller amounts of phloem and populations decline to endemic levels. Widespread mountain pine beetle morality results in conditions favorable for stand replacing wildfires or succession to late seral vegetation.

In the 1960's and 1970's the Island Park area experienced large areas of mortality in the lodgepole pine. This led to extensive salvage and clearcut harvesting in the late 1970's through the 1980's. Due to this harvesting, a significant amount of the lodgepole pine forest in the area has been converted to seedling/sapling size classes. Despite more than 50% of the lodgepole pine forest in the mature age classes, the patch sizes are small enough not to promote a large outbreak. Currently, there is a low risk of a mountain pine beetle outbreak in the lodgepole pine cover type for quite a long time. In the whitebark pine cover type, competition from subalpine fir and Engelmann spruce, and the infection of white pine blister rust will continue to stress whitebark pine making them susceptible to mountain pine beetle attack.

Douglas-fir Beetle

The Douglas-fir beetle is the most destructive insect affecting Douglas-fir throughout its range. Normally, Douglas-fir beetle attacks small groups of trees however, during outbreaks, mortality of hundreds to thousand of trees are not uncommon. Significant losses can occur during periodic outbreaks. Outbreaks usually last 2 to 4 years, however, prolonged drought can extend the duration causing thousands of acres of mortality. At low endemic levels, beetles infest trees injured with fire scorch, excessive defoliation, root disease, and drought stress. Where these type of trees are abundant, populations build up and spread to existing standing green trees. Stands that are susceptible to Douglas-fir beetle have several types of conditions. These are:

1. A high percentage of Douglas-fir. Usually in excess of 50-60%.
2. Douglas-fir tree ages greater than 100 years.
3. Tree size of Douglas-fir. Trees greater than 14" DBH are highly susceptible.
4. Overall stand density. Stand densities over 120 basal area become moderately susceptible. Susceptibility increases as basal area increases.

Historically, Douglas-fir beetle was at endemic levels in the assessment areas. Douglas-fir stands were maintained at low densities due to frequent fires. However, fire suppression in this century has changed the structure of the Douglas-fir forest. Higher percentages of Douglas-fir, and stand densities have increased. Currently, the majority of the Douglas-fir cover type stands in the assessment area is at moderate to high susceptibility. Drought in the past several years has stressed these stands and triggered a Douglas-fir beetle outbreak in the assessment area. A western spruce budworm outbreak has also caused these stands to be stressed further. Based on recent surveys in 2002 and 2003 approximately 2,500 acres have had significant mortality (>70%). Within the vicinity of the area Douglas-fir beetle populations are at epidemic levels. With the abundance of highly susceptible stands, large patches of mortality are expected to occur. However, a significant change in long-term weather patterns or extended periods of intensely cold weather could slow the current outbreak (Bennett, Gibson, 2003).

Western Spruce Budworm

Western spruce budworm is the most widely distributed and destructive defoliator of coniferous forest in western North America. The first recorded instances of outbreaks in the United States were in Oregon in 1914. Western spruce budworm is a native defoliator that has co-evolved with its host. It feeds on a variety of host but the most significant damage is found in Douglas-fir stands. There is no typical pattern or trend in western spruce budworm outbreaks. However, outbreaks tend to somewhat cyclic, but cycles may be long, with short intervals between them. In the Intermountain west some outbreaks have lasted from early 1970's to the early 1990's. Outbreaks can infest large areas of susceptible host. In 2002, 11,700 acres of infested stands were recorded in northern portions of Caribou-Targhee National Forest. Part of this is within the assessment area. Some outbreaks can be severe and can cause growth loss, kill the tops of the host, and in some cases with multiple years of defoliation can cause mortality. Damage is usually the heaviest in the understory of multi-storied stands. These insects also affect the regeneration success by feeding directly on young trees or destroying

developing cones. There are several criteria that influence the size and intensity of western spruce budworm outbreaks. They are:

1. Warm, dry Douglas-fir habitat types are more susceptible.
2. Species composition- Douglas-fir and true firs are more likely to be infested.
3. Stand density-densely stocked stands more often damaged.
4. Uneven aged or multiple storied stands sustain more damage.
5. Host vigor – less vigorous trees sustain more damage
6. Stand age – older trees sustain more damage than younger ones
7. Surrounding forest types- forest of host type sustain longer, more wide-spread outbreaks.

Historically, within the assessment area western spruce budworm outbreaks have occurred. Crooks in the bole of Douglas-fir trees in the area are evidence of historical outbreaks. However, damage or mortality from western spruce budworm was probably less severe due to higher composition of non-susceptible host and stand densities tended to be lower. Currently, a western spruce budworm outbreak is occurring in the area. The outbreak began in 2001. Approximately 600 acres of light defoliation is occurring now, however since this is early in the outbreak more defoliation is likely to occur. Majority of the Douglas-fir stands are highly susceptible western spruce budworm. Moderate to high damage is likely to occur in most Douglas-fir stands. Due to several years of drought and stand densities that are high, trees are highly stressed which will lead to higher probability of mortality occurring from defoliation. The trend for the assessment area is outbreaks will continue to occur and may be more severe in the future (Bennett, Gibson, 2003).

White Pine Blister Rust

The white pine blister rust is one of the most significant agents of change on whitebark pine stands. White pine blister rust is a non-native disease that was introduced to the United States in the early 1900's. The host are 5-needle pines including, whitebark pine and limber pine (*Pinus flexilis*). The rust needs a host to complete its life cycle. It spends part of its life cycle on the 5-needle pines and the other on currants or gooseberries in the genus *Ribes.* The disease causes cankers on branches of the host trees. Eventually the cankers kill the branches and eventually the tree. The disease also weakens the tree and predisposes it to mountain pine beetle attack as well. Since blister rust is an introduced disease and did not evolve here, genetic resistance is very low. Due to this high mortality rates occur. Currently, whitebark pine in the assessment area has some of the highest infection levels of the disease in Idaho.

Several phenotypic resistant trees have been identified in the assessment area. The cones from these trees have been collected and are currently being tested for genetic resistance. However, to get reliable results and a sustainable genetic resistant program could take up to 15 years to develop.

The trend for this disease in the assessment area will be very destructive to whitebark pine stands and eventually may eliminate them from the assessment area.

Active logging and grazing started occurring as early as late 1800's to early 1900's within the assessment area. In the lower elevations, many Douglas-fir trees were "high-graded" where there were accessible slopes. Range fires may have been set as well to improve grasses for grazing. Between 1920 and 1925 the railroad was expanded into the Island Park area. This caused a significant increase in harvesting of lodgepole pine for railroad ties. During the depression and war years lumber demand was reduced in the area. However, after the war demand increased in the area. Between 1953 and 1964 annual harvest on the District was between 9 and 18 million board feet. In the mid 1960's, the addition of modern stud mills and a mountain pine beetle outbreak an extensive salvage program developed. From 1964 to about the mid 1990's approximately 100,000 acres were salvaged on the District. Due to the large salvage program, the majority of the seedling/sapling and pole size structures in the lodgepole pine are a result of this. Limited harvest in the mixed and Douglas-fir stands occurred within this time period. Approximately 300 acres of harvest occurred. Most of the harvests were commercial thinnings or seedcuts. The majority of seedcuts in the Douglas-fir failed to regenerate. Most of these areas were planted with lodgepole pine. The most recent sale to occur in the assessment area was Willow Creek. Treatments mainly included commercial thinning and restoration of aspen within Douglas-fir stands.

Currently, timber production in the area has been on a downward trend similar to the rest of western United States. Currently, only 3 large mills operate in the area. Willmore Lumber (formerly Stoddard Lumber) is located in St. Anthony, Idaho; RY Timber in Belgrade, Montana; and Louisiana Pacific in Deerlodge, Montana. Special products such as post and pole, house logs, and personal use firewood are still in high demand in the area and miscellaneous small businesses are scattered in the area.

Under the Revised Targhee National Forest Plan 70% of the forested vegetation is in timber management prescriptions 5.x. 41% of the forested vegetation is in the Mount Jefferson roadless area. Under current plans and management constraints, approximately 55% of the forested vegetation in the Blue Creek Watershed Assessment area could be considered or available for timber harvest to meet vegetation management objectives. This percentage of area is outside of roadless areas and in management prescriptions 5.x. The majority of these areas are in Grizzly Bear Management Units (Management Prescription 5.3.5) which limits the scope and amount of vegetation management activity that can occur.

Aquatic Species and Habitat

Data Sources

- Fish Distribution Reports Targhee National Forest (2002 and 2003)
- Field notes and data collection (Mabey, 2003)

- Upper Henrys Fork Habitat Assessment Headwater to Island Park Dam Summer 1996 (1997, by Jim Gregory for the Henrys Fork Foundation)
- Comprehensive State Water Plan Henrys Fork Basin (Idaho Water Resource Board 1992)
- Aquatic Resources of the Henrys Fork Watershed (Intermountain Journal of Sciences, Vol. 6, No. 3, 2000)
- Photos by 2002-2003 fisheries crews, Lee Leffert, Lee Mabey, D.L. Gustafson, and USBR
- Hydrologic Alteration in the Henrys Fork Watershed Upstream of St. Anthony (Rob Van Kirk Idaho State University 2004)
- Hybridization and Introgression in a Managed, Native Population of Yellowstone Cutthroat Trout: Genetic Detection and management Implications. (Matt Campbell, Jeff Dillon, and Madison Powell, Transactions of the American Fisheries Society 131:364-375, 2002)
- Website on New Zealand Mudsnails www.esg.montana.edu/aim/mollusca/nzms
- Forest aerial photo coverage 1995
- Bjornn T. C. and D.W. Reiser 1991. Habitat requirements of salmonids in streams. American Fisheries Society Special Publication 19:83-138

Data Gaps

- R1/R4 Stream Habitat Surveys
- Knowledge of Conditions on Private Lands

Current Stream/Fisheries Conditions

There are four named streams that recently have been dry at least part of the year and do not support fish. These streams are Tom, Dry Canyon, Blue, and White Elephant Creeks. Ted Kellogg reported finding brook trout in Blue Creek in earlier years, but in 2002 Blue Creek was dry. Henrys Lake and Island Park Reservoir border the analysis area on the north and south ends. Fish populations within these lakes and reservoirs have a direct affect on the surrounding stream populations.

Arange Creek

Arange Creek supports a very small population of brook trout. Brook trout were the only fish species found. Brook trout sizes ranged from 65 to 155 millimeters. Most of these fish were caught in deep plunge pools created by the abundant large woody debris. Large woody debris is important in this stream to maintain stability and habitat in this steep stream. Undercuts also provided good shelter for captured brook trout in these units.

Hotel Creek

Hotel Creek consists of three forks, east, main, and west. Arange Creek is a tributary to the west fork. Brook trout were the most abundant species in 2003, 6 rainbow trout were also reported (5 from one unit) indicating a connection to Island Park Reservoir. The 2.5 mile section of the stream that ran through private property between the reservoir and the Forest Service boundary was not sampled, but is likely to have a higher number of

rainbow trout. Creel census data in 1976 from Idaho Fish and Game (IDFG) reported 86% brook trout, 10% rainbows, 3% cutthroat, and 1% coho salmon. The coho and most likely the cutthroats were migrants from Island Park Reservoir. The 2.5 mile section of the stream that ran through private property between the reservoir and the Forest Service boundary was not sampled, but is likely to have a higher number of rainbow trout.

The West Fork was fishless above Arange Creek. The stream in this reach was in poorer condition. High entrenchment, turbid water, and stream captures by an old logging road indicate habitat issues on this stream. Below Arange Creek, a non-system ATV trail and crossing were reported (Figure 81).

Figure 81 ATV Crossing on Hotel Creek

The main fork is the shortest of the forks. Five of the six rainbows were found in this fork. A non-system ATV trail crossed the creek on what appears on the USGS map as a jeep trail, likely an old logging road.

Three miles of the East Fork were sampled. Almost all of the brook trout were caught near the confluence with the main stem. These fish were associated with deep meander pools and large woody debris.

Moderate amounts of past beaver activity were present in the lower reaches of all forks. Old beaver cuttings and stumps were noticed throughout the area, however no present beaver activity was noted. Heavy browsing of the willows by wildlife and some bank damage was noted. ATV trails crossing the stream and campsites along the banks influenced the physical habitat in different areas.

Yale Creek

Yale Creek runs through the Yale Creek subdivision below the Forest and as an extension of the subdivision a non-system ATV trail runs parallel to the stream with several stream crossings for the first 1.5 miles on the Forest (Figure 82 **Typical stream condition.**, Figure 83). Brook trout are the only species reported. Cold Maximum water temperatures of 8 to 10° C in the middle of July are not conducive to fish growth.

Figure 82 Typical stream condition.

Figure 83 Yale Creek ATV crossing.

Mill Creek

IDFG creel census (1977) data indicated a population dominated by 91% brook trout, 8% rainbows, and 1% kokanee. Forest survey data (2002) reported brook and rainbow trout, kokanee salmon, longnose dace, sculpin, and red-side shiners indicating a connection to Island Park Reservoir. There are three major stream crossings (Figure 84) associated with non-system roads and trails and power line right of way. Impacts from these crossings are attributed to the lack of trout in the middle units of this stream and heavy deposits of silt along the stream bottoms. An active beaver complex also exists in the drainage.

Figure 84 Three stream crossings on Mill Creek

Elk Spring Creek

IDFG reported cutthroat and brook trout circa 1967. Forest surveys (2003) reported 86% brook and 14% rainbow trout, and sculpins. Most fish were found in the first unit sampled near the confluence with the Henrys Fork. The higher numbers of rainbow can be attributed to the influence of the Henrys Fork. No fish were found greater than a half mile from the Henrys Fork. An old jeep trail crosses the stream near the Henrys Fork and then converts into an ATV trail that follows the creek upstream for about a third of a mile where it crosses again (Figure 85). The stream appears to be a Rosgen E-type channel that is narrow and deep with a readily accessible floodplain and is shaded by a dense growth of tall carex (Figure 86).

Figure 85 Stream crossing.

Figure 86 Natural conditions; stream is shaded.

Coffee Pot Creek

In 2003 four 40-meter units and one 100-meter unit were sampled resulting in the capture of only seven brook trout. This stream is small with a high gradient that creates less than ideal fish habitat. The culvert on Forest Stamp Meadows Road 052 is undersized causing deposition upstream and erosion downstream (Figure 87, Figure 88) leading to an oversized channel immediately below and above the culvert. The culvert has a sloped installation and creates a partial barrier to fish.

Figure 87 Downstream view of widened channel.

Figure 88 Upstream view of braided channel.

Visual observations suggest there is more sediment below the road than above indicating there is improper drainage on the road. Maximum water temperatures likely are on the cold side.

Tyler Creek

In 2003, Forest fisheries crews reported a moderate population of small brook trout. This stream just north of Coffee Pot also has culverts affecting the stream under Forest Road 052. The stream upstream of the culvert seems to be functioning properly downstream however the stream is over widened. The culverts themselves do not appear to be a fish barrier however the downstream-overwidened rocky channel provides less than an ideal approach. One correctly sized culvert may allow the stream to reach its potential downstream of the culvert (Figure 89, Figure 90). Maximum water temperatures likely are on the cold side.

Figure 89 Downstream of culvert.

Figure 90 Upstream of culvert.

Un-named stream (South Sawtell Creek)

This creek is south of the named Sawtell Creek on the Forest. There is a small pond of approximately 1.5 acres in size when full (Figure 91). This pond is not known to have ever filled completely. Forest Road 455 goes over the fill used to create the pond. This pond was built as part of a storage and irrigation system for the Mickelsen 7-Ranch. It currently is used to store runoff and deliver that water over a period of time. The existing weir is not functional so water levels depend on inflow, and outflow depends on head in the pond. When the pond was built 0.3 miles of stream was diverted into a straight ditch

above the pond and 0.6 miles of stream were diverted below the pond. Because of this ditching fish habitat was lost and the channel has down-cut moderately to severely (Figure 91) and filled the ponds with sediment. There is no direct connection of this stream to the Henrys Fork.

The fishery consisted solely of brook trout in 2003 before the stream was treated by IDFG with rotenone a highly efficient piscicide to remove brook trout in preparation for re-introducing Yellowstone cutthroat to the creek. The creek is to be re-treated in August of 2004 and if no brook trout are found cutthroat will be introduced. A habitat restoration project is also underway in this creek to deepen, and stabilize the pond. The upper portion of the original channel still contains a vibrant willow community into which the stream will be diverted back into out of the eroding ditch.

This stream is within the Sawtell sheep and goat grazing allotment. This allotment is currently vacant. However, impacts from trespass cattle are light to moderate with the highest use between the pond and the upper diversion point. Putting the stream back into the willow-lined channel will provide some protection of the stream.

Figure 91 Left partly filled pond, Right down-cut ditch upstream of pond with cattle impacts.

The shallow edge water of the pond serves as habitat for the chorus frog and is also known to be important habitat for the western toad (*Bufo boreas*). Water from this pond is diverted into ditches and ran out through the Mickelsen 7-Ranch to provide stock water. The ranch owner who is also the water right and easement holder is a willing and cooperative partner in the restoration effort along with the Natural Resource Conservation Service, and Henrys Fork Watershed Council.

(North) Sawtell Creek

This is the named Sawtell Creek as shown on the Forest map. There is a small pond of approximately 2 acres in size when full (Figure 92) .3 miles from the Forest Boundary. This pond is not known to have ever filled completely. There is a non-system road that goes over the fill used to create the pond. This pond was built as part of a storage and irrigation system for the Mickelsen 7-Ranch. It currently is used to store runoff and deliver that water over a period of time. The existing weir is functional so water levels depend on inflow and operation of the weir. When the pond was built 1.7 miles of stream

was diverted into a ditch that runs down the ridgeline before emptying into the pond. The natural drainage enters into the same pond. The ditch appears surprisingly natural in the upper parts but as it gets closer to the pond severe down-cutting has occurred and is also filling of the pond with sediment. It is somewhat puzzling as to why the water was diverted in the first place. There is no direct connection of this stream to the Henrys Fork.

There is an old jeep trail that parallels the stream that has become a non-system ATV trail. This trail has also captured the stream flow when the ditch cannot handle spring runoff or is clogged and 18 inch plus deep ruts have resulted that run for some distance (Figure 93).

The fishery consisted solely of brook trout in 2003 before the stream was treated by IDFG with rotenone a highly efficient piscicide to remove brook trout in preparation for re-introducing Yellowstone cutthroat to the creek. The creek is to be re-treated in August of 2004 and if no brook trout are found cutthroat will be introduced. A habitat restoration project is also underway in this creek to deepen, stabilize, and fence the pond. The upper portion of the original channel is more entrenched and bedrock controlled with few remnant willows, as the pond is approached the gradient flattens out and the old channel becomes less defined. Water temperatures are 9 to 14° C and more conducive to fish growth.

This stream is within the Bootjack cattle grazing allotment. Grazing impacts are moderate to heavy with the highest use near the pond and the ditch by Forest Road 455.

Figure 92 Partially filled pond

Figure 93 Ruts formed by spring stream capture on jeep trail.

Water from this pond is diverted into ditches and ran out through the Mickelsen 7-Ranch to provide stock water. The ranch owner who is also the water right and easement holder is a willing and cooperative partner in the restoration effort along with the Natural Resource Conservation Service, and Henrys Fork Watershed Council.

Un-named stream (South Fork Bootjack Creek)

This stream is similar to Sawtell in that it is diverted out of its original channel and flows through a somewhat naturalized ditch to the Mickelsen 7-Ranch that holds the easement. Recent dredging of the ditch near the Forest Boundary has left extremely raw banks that are unlikely to heal given the grazing use. This stream is part of the Bootjack grazing allotment and has moderate to severe grazing impacts (Figure 94). Roads, fords, recreation, ditches and culverts also impact this stream (Figure 95). Grazing impacts lessen further upstream (C-T 2002 Surveys). Excess sediment, entrenchment, trails and crossings were attributed to cattle and ATV's. Brook trout have been visually observed in this stream.

Figure 94 Left, trampling impacts; Right, moderate grazing along stream

Figure 95 Left, stream crossing to campsite; Right, showing stream in wooded area. Bootjack Creek.

The north fork of Bootjack Creek is an intermittent stream with no river connection and was dry near the forest boundary during the 2002 Forest survey. In 2003, IDFG, Forest Service, and Henrys Fork Foundation extensively electro-fished the upper reaches that

have perennial water. During these surveys no fish were found. There are several non-system roads and trails in use impacting the stream. Grazing has had moderate to severe impacts on the stream (Figure 96). There is sufficient water to provide beaver habitat up high but the forage is limited.

Figure 96 Left, down-cut with evident cattle damage; Right, non-system trails with impacts.

Hope Creek

Hope Creek is a small tributary to Henrys Lake. This stream supports very low numbers of brook trout. There are impacts from non-system roads and trails. ATV trails from private cabins link road 463 through Hope Creek to Rock Creek (Figure 97). There is also a non-system trail beginning at road 053, 800 feet east of road 463, which connects to the non-system trail mentioned previously.

Figure 97 Non-system ATV trail.

The poor condition of the lower habitat prohibits use of this tributary by adfluvial Henrys Lake cutthroat. Some private property is heavily grazed with little protection given to the stream. This stream has multiple diversions and ditches that are used to irrigate pasturelands near Henrys Lake. The landowner states that it is the irrigation water that raises the sub watering Kinney Creek. Connectivity, through private land due to diversions and habitat alteration, is lacking. In 2003, the BLM acquired approximately one-quarter mile of lower Hope Creek next to the lake as well as part of Kinney Creek.

Figure 98 Left Hope Creek north of road 053, Right Hope Creek south of road 053.

Kinney Creek

Kinney Creek lies within private and BLM ground and is the unnamed stream east of Hope Creek on the Forest map. Springs and an irrigation diversion from Hope Creek feed this stream. Forest fisheries crews did not sample this stream. It is doubtful that any game fish occur in this creek. Low flows and degraded habitats make it inhospitable for use by adfluvial cutthroat (Figure 99).

Figure 99 Kinney Creek recently acquired by BLM, Kinney Ck. downstream of previous on BLM land exclosure.

Rock Creek

Three brook trout were caught in the first two 40 meter units that were sampled. In the remaining 5 units that were sampled upstream no fish were sampled. One brook trout was a rather large 11 inches (Figure 100). This stream though small has the potential to provide a better fishery. Much of this potential is lost due to multiple irrigation

diversions and poor habitat conditions on private lands eliminating connectivity to Henrys Lake and adfluvial Yellowstone cutthroat. There is an extensive network of non-system ATV trails in this drainage, with the main access being provided by the jeep road accessing the diversion.

Figure 100 Left 11 inch brook trout, Right Rock Creek before the diversions.

Crooked Creek

Crooked Creek is approximately 4.5 miles in length and occurs only on private lands. The lower reaches near the confluence with the Outlet likely contain fish. It may have had its origination as the original channel from the Henrys lake Outlet, before enlargement of Henrys Lake and the use of the stream channel as a conduit for high irrigation flows, it also picked up additional water from springs in the area. It appears from aerial photos that after the dam was built a channel was cut connecting the Outlet directly to the channel created by Twin Creek (Figure 101).

Figure 101 1995 Aerial photo showing suspected cut-off channel.

Henrys Lake Outlet

Henrys Lake outlet is the stream draining Henrys Lake. There are approximately 8 miles on private lands with 2 miles on Forest Lands. In 1924, the dam on Henrys Lake was completed allowing additional storage and release of water for irrigation needs. This has resulted in reduced winter and spring flows and increased summer flows. Van Kirk (2004) reports that Henrys Lake Outlet has the highest hydrologic alteration of the Henrys Fork upstream of St. Anthony. This hydrologic alteration has led to the straightening of the channel (due to high flows and mechanical alteration), severe erosion, elimination of willow recruitment, and loss of fish habitat (Figure 102).

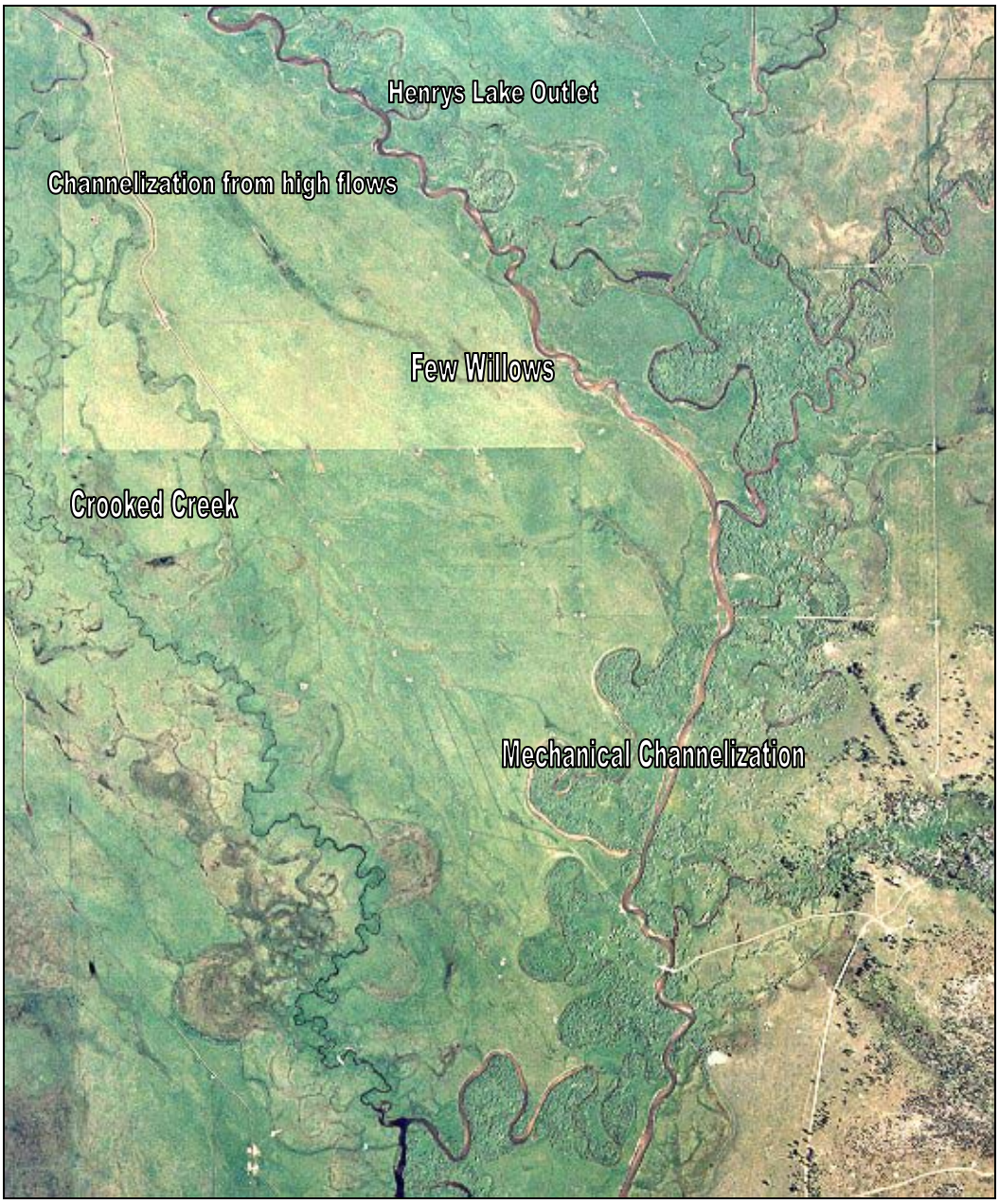


Figure 102 1995 Aerial photo of the Henrys Lake Outlet showing channelization and lack of willows recruitment.

During 2002, the Forest fisheries crews surveyed the Flat Ranch owned by the Nature Conservancy. This survey was located on the upper half of the photo (Figure 102) and started June 26th before irrigation flows began in earnest. A total of eight 40 meter units and two 100 meter units were sampled (Figure 103). Eighteen trout were caught in the first unit surveyed and eight trout were found in the other nine units. All the trout but one were caught in association with willows. Both brook and rainbow trout were caught as well as abundant numbers of sculpin, dace, and shiners. No cutthroats were found although they are known to pass through the dam at Henrys Lake.

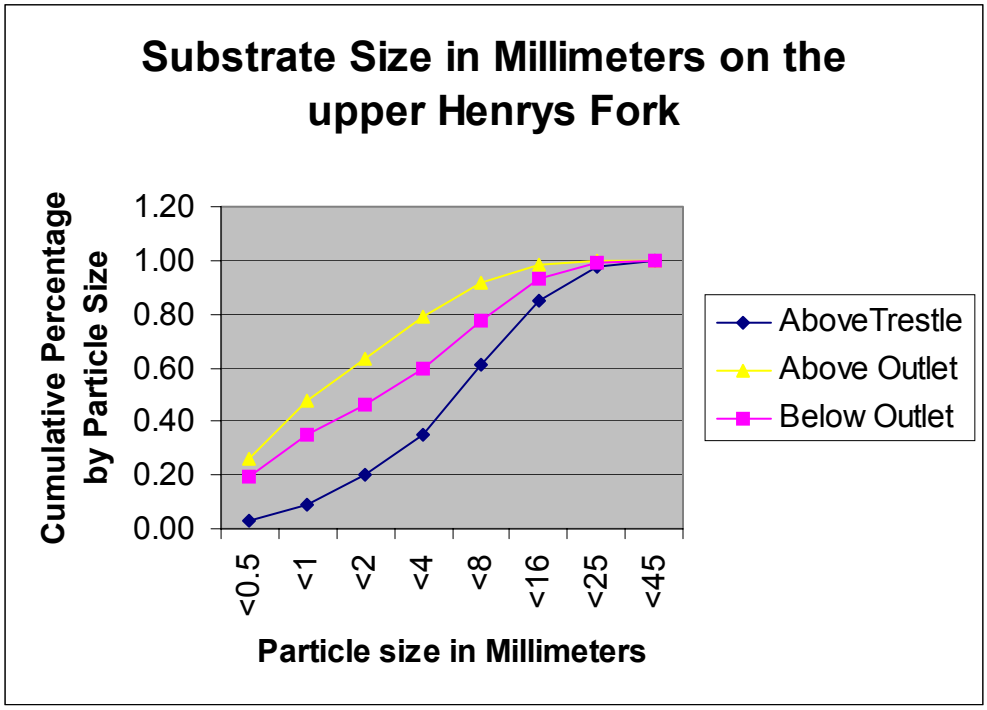
Figure 103 Photos representative of reaches surveyed on the Henrys Lake Outlet.

Upper Henrys Fork

Henrys Lake Outlet and Big Springs heavily influence the upper Henrys Fork from Big Springs to Island Park Reservoir. Big Springs provides a relative constant flow of high quality water with an important spawning area upstream of the trestle. Gregory (1997) reports that the best spawning sites exist between big springs and the trestle and below Coffee Pot Rapids. He also reports finding brook trout, rainbow trout, cutthroat trout, rainbow-cutthroat hybrids, whitefish, dace, sculpin, chub, and red-side shiners.

In 2003, Mabey collected substrate samples at three locations on the upper Henrys Fork. The sample sites were above the trestle, above the confluence of Big Springs and the Outlet, and the upper Henrys Fork near the first cabins below the Outlet. Six samples were taken at each site and then air dried for at least 3 months and sieved through a soil shaker and each fraction weighed. The results can be viewed in Table 17. Below the trestle there are considerable more fines and spawning habitat is limited. None of the sites contained ideal spawning habitat as larger gravels are absent and fines are greater than 25 %. Cumulative fines of greater than 40% for particle sizes less than 4 mm in diameter is known to effectively eliminate spawning success for trout (Bjornn and Reiser 1991). Cumulative percentages above the trestle, above and below the outlet were respectively 35, 79, and 60%. Silts and clays were also much more noticeable in the site above the outlet. The reason for higher sediment levels above the outlet is likely due to changes in stream power from higher flows below the confluence and greater ability to transport sediment. Spring dominated systems generally have higher sediment levels since spring runoff flows may only be 2 to 3 times higher than base flows where as normal runoff dominated stream may have spring flows 15 times greater than base flows.

Table 17 Substrate size in millimeters on the Upper Henrys Fork.



Fishing has declined in this section of river due to repeated chemical treatments of Island Park Reservoir and introduction of Utah chubs. Reasons for the decline will be covered in more detail in Step 4. Efforts are underway by IDFG to restore cutthroat to this section of the river. In 2002 and 2003, 40,000 to 70,000 catchable Snake River cutthroat (fine-spots) have been stocked at various points in the upper Henrys Fork in an effort to re-create a cutthroat fishery in this reach. In the mid 1980's to early 90's Henrys Lake cutthroat fingerling were stocked but apparently did not take. In 2003, 6,000 "Sterile" triploid catch-able rainbows were also stocked.

Henrys Lake

Henrys Lake is a natural lake that was enlarged by the construction of a 16 foot high dam in 1924 that enlarged the capacity of the lake to 90,400 acre feet (Figure 104). The lake lies in a small drainage area of 99 square miles. Runoff from this drainage area is only enough to fill half the capacity of the lake in a normal year. The average depth is 12 feet with the deepest spot near Staley Springs being 25 feet. Lush plant growth occurs yearly and when lake levels are low during the winter, plant decomposition and low oxygen levels are not uncommon which sometimes result in localized fish die-offs.

This lake is well known for its productive waters that regularly produce 3-5 pound trout and larger. Fishing is known to be sporadic and particularly slow the past two years. The main species in this lake are rainbow-cutthroat hybrids, Yellowstone cutthroat, and brook trout with the emphasis by IDFG being cutthroat-rainbow hybrids. Most of the production of Yellowstone cutthroat and hybrids are a result of the Henrys Lake Hatchery and egg taking operations. Streams that still have natural recruitment are outside the analysis. Genetic testing of Yellowstone cutthroat randomly sampled from the lake

reported 63.4% had genotypes indicative of pure cutthroat (Campbell et al 2002). Recently IDFG has begun to sterilize most hybrids stocked, which should help to minimize the introduction of more genetic material from rainbows.

Figure 104 Henrys Lake south shoreline forms the northern most boundary of the Blue Creek analysis area.

The lake is surrounded by ranching operations except for the development along the north side and other small recreational sites. The BLM and State of Idaho own about 3.5 miles of shoreline with the Forest service owning a fraction.

Island Park Reservoir

Island Park Reservoir was constructed between 1935-1938 on the Henrys Fork River storing water from a drainage basin of 482 square miles. It is an earthen dam 91 feet in height with a storage capacity of 135,205 acre-feet (Figure 105). It is a popular fishing and recreation reservoir, however its main purpose is to provide irrigation water to the Fremont Madison Irrigation District. During drought years, it is nearly emptied and the fishery suffers. In 1994, a hydroelectric plant was added to the dam. The inlet to the hydro facility is screened but other outlets remain unscreened. When water drops below a certain level, power can no longer be generated and all water entering the Henrys Fork is unscreened and can transport large numbers of fish. The reservoir has been highly managed and has had a great influence on the fishery.

Figure 105 Island Park Dam and Reservoir (Courtesy of USBR).

Other Topics of Concern- Aquatic Invasive Species

The New Zealand mudsnail (Figure 106), *Potamopyrgus antipodarum* was first discovered in the mid-Snake River, Idaho in the 1980's. It is a parthenogenic livebearer with high reproductive potential. The New Zealand mudsnail often reaches densities greater than 100,000/m2 in suitable habitat and has been reported to approach densities as high as 750,000/m2 in sections of rivers in Yellowstone National Park. Frequently, these mudsnails will comprise over 95% of the invertebrate biomass in a river. To date, limited research has documented decreases in native macroinvertebrate populations in several rivers where the mudsnail has invaded. Its spread into new systems is considered to be primarily human caused (www.esg.montana.edu/aim/mollusca/nzms/).

Figure 106 New Zealand mudsnail (courtesy of D.L. Gustafson, Montana State University).

The nearest documented occurrences of this species is the Buffalo River. Due to the ease of transfer the New Zealand mudsnail is likely already in the upper Henrys Fork or will be soon. The snail has a wide tolerance of living conditions. Full ecological impacts of the snail are not currently known.

Terrestrial Species and Habitat

Gray wolf (*Canis lupus*) – In the Rocky Mountains, there are an estimated 1300 wolves in Montana, Idaho, and Wyoming. The population has exceeded the recovery goals established before reintroduction.

Wolves have been reported in the Blue Creek watershed area. A wolf was killed while in the act of preying on cattle in the Kilgore area, which is approx. 15 miles west of the watershed area. During 2006, an adult wolf was struck by a car and killed two miles north of the Idaho border along Highway 87.

Regulated and controlled wolf mortality is possible from wolf – human or livestock interaction but is outside the control of the USDA Forest Service. Illegal killing is also possible but the amount of total mortality has not prevented the expansion and increase of the wolf population to meet recovery targets. Conflicts may be expected if wolves attempt to become established in the watershed. As of February 2007, the US Fish and Wildlife Service has proposed that wolves in Idaho, Montana and Wyoming be removed from the list of Threatened and Endangered species. The final rule for delisting is expected in December 2007. This will return management of the species to the states.

Canada lynx (*Lynx canadensis*) –All of the Centennial Mountains has been split into three Lynx Analysis Units (LAUs). The vegetation in the LAUs has been separated into several habitat categories including Primary suitable and secondary suitable habitat. The Blue Creek watershed is within LAU 4 and 5. The Centennial Mountains also links the Greater Yellowstone area with the Central Idaho area. However, existing and future conditions of the private lands and major roadways between the pieces of National Forest land may present the biggest barrier to wildlife that attempt to migrate between these areas.

Habitat for lynx in the watershed is primarily Douglas fir with subalpine fir at higher elevations and on north slopes. This habitat contains a sparse population (< 1.0 per hectare) of snowshoe hares. Alternative prey such as red squirrels is abundant within the watershed. It is unlikely that a local lynx population could survive with these low hare densities. A survey that followed the National Lynx hair-snaring Protocol was conducted in the Centennial Mountain range in 1999 and 2000. This effort did not produce any evidence of lynx.

Figure 107 Wolverine

Wolverine (*Gulo gulo*)- The Blue Creek Watershed does have identified potential denning habitat for wolverines. Annual surveys were conducted in 1998-2000 to determine presence of wolverines in identified denning and general habitat. Wolverine tracks were identified in the watershed during these surveys, however no evidence of denning was present (Heinemeyer, et al. 1999 Heinemeyer, et al. 2001). During March 2003 a wolverine was live trapped 3 miles northwest of the watershed as part of a research project

(Figure 107). This animal was fitted with a GPS collar and a VHF radio was surgically implanted. A bear killed this wolverine in late April in the Gravelly Range in Montana. A male wolverine from the Teton Range that was also radio instrumented moved into the vacant territory later that summer. This male was trapped legally in Montana the following winter. A female wolverine was trapped and radio instrumented in the Targhee Creek/ Mile Creek area and is known to have a home range here.

Boreal owl (*Aegolius funereus*) Suitable nesting and foraging habitat (Groves et al 1997) is found in forest stands in the Blue Creek Watershed. The majority of the conifer stands in the watershed are predominately Douglas fir, but Engelmann spruce and Sub-alpine fir does occur within the watershed. The majority of the conifer stands are in the mature age class. Annual surveys during the courtship period have documented presence of boreal owls throughout the watershed. During the spring of 2005 several nest stands were identified.

Great gray owl (*Strix nebulosa*) - Suitable nesting and foraging habitat exists within the Blue Creek watershed. The majority of the conifer stands are in the mature age class. Annual spring surveys during the courtship period have documented the presence of this species throughout the watershed. Summer observations are made each year and several nest locations are known.

Flammulated owl (*Otus flammeolus*) - Suitable nesting and foraging habitat does not appear to exist in the watershed. The extremely short frost free season within the watershed may limit use by this insectivore. A majority of the aspen stands have been replaced with encroaching conifer but soft snags still exist for cavity nesting. Flammulated owls have not been identified in the watershed during spring surveys.

Northern goshawk (*Accipiter gentilis*) - Suitable nesting and foraging habitat exists within the watershed. There are several known goshawk territories within the watershed. There are many stands within the watershed that provide potential nesting habitat for this species. The current epidemic of Douglas Fir bark beetle may change habitat for this species as large trees are killed and the canopy opens.

Three-toed woodpecker (*Picoides tridactylus*) - Suitable nesting and foraging habitat is found throughout the Centennial Mountains and within the Blue Creek Watershed. Bark

beetle mortality is at epidemic levels which should increase use of the area by this species. A large majority of the stands are in the mature age class with adequate foraging snags throughout.

Mule deer – Population levels are meeting state objectives. Deer in the Blue Creek Watershed move to lower elevations west of Ashton to winter. Most winter range is on either BLM, state or private lands. National forest lands may be used in spring as snows recede. Current populations fluctuate from year to year based on fawn survival and habitat conditions. Loss of aspen through conifer competition may be affecting the mule deer population (IDFG Mule Deer Initiative).

Elk – Population levels are meeting or exceeding state objectives. A large number of elk range on the summer habitat in the Blue Creek Watershed. Elk on the Ashton/Island Park Ranger District are highly migratory and migrate to the desert west of St Anthony for the winter months. Decommissioning of unneeded forest roads during the late 1990's for grizzly bear security caused a significant decrease in Elk Vulnerability during the hunting season. This also increased Elk Habitat Effectiveness in the area.

Grizzly Bear - The Blue Creek Watershed is within the Henrys Lake Bear Management Unit (BMU). This BMU is occupied by grizzly bears and has shown an increase in use by bears in recent years. During 2005 and 2006 research trapping efforts have placed seven collars on bears in the Island Park area. GPS locations from the collars show most of these bears using the Blue Creek Watershed at sometime while they wore the collar. The US Fish and Wildlife Service have proposed to de-list the Yellowstone population of grizzly bears. The final delisting rule is expected to be published in the late spring of 2007. Recently (2004-2006) the Idaho Fish and Game and the US Forest Service have collaborated to try to reach as many residents as possible in Island Park about sanitation issues associated with living in bear country.

Range and Livestock

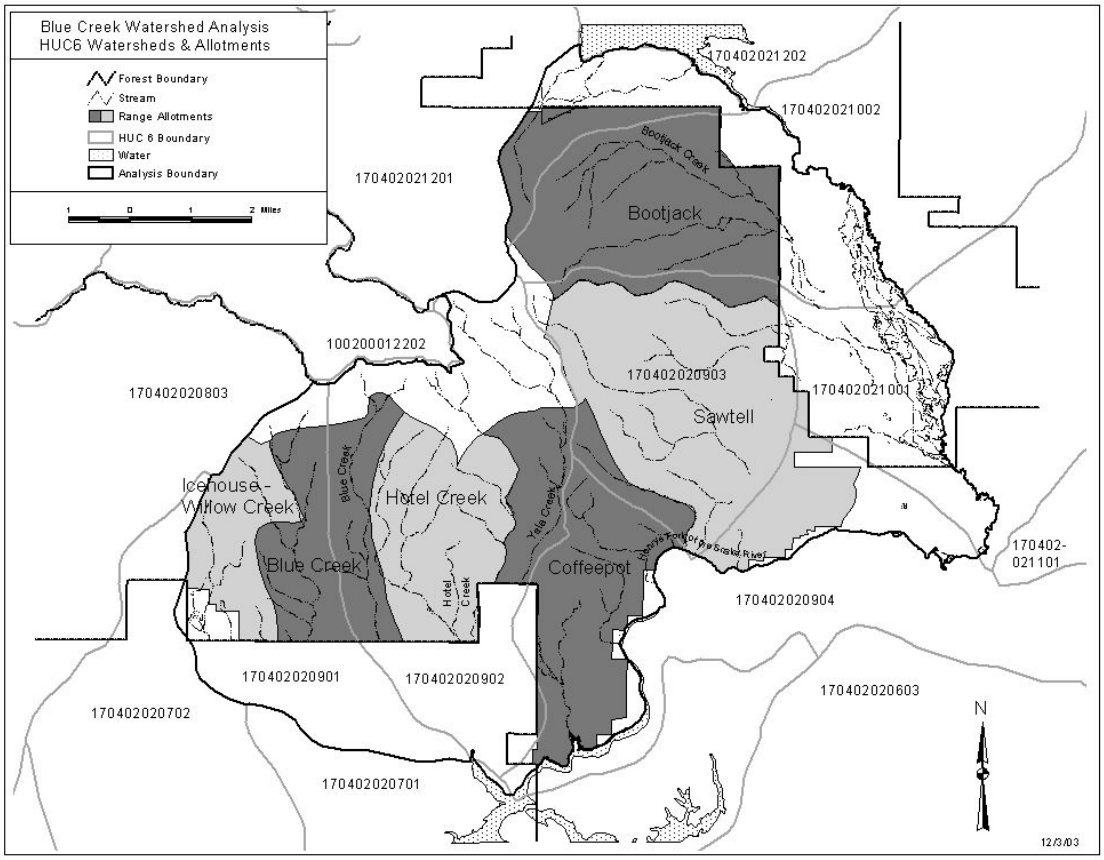


Figure 108 Location of range allotments within the Blue Creek analysis area.

Bootjack C&H

There are three special use permits on the allotment. One is for two small irrigation reservoirs and is related to ditches on the east side of the allotment. This system takes water from Sawtell Creek and Bootjack Creek and distributes it for irrigation on private land. The second permit is for another ditch which divides water from Rock Creek for irrigation. The third permit is for a transmission line and associated cables that provide power to Sawtell Estates and the FAA radar site on top of Sawtell Peak. From 1975 to 1982 there was 502 acres of timber harvested. Currently there is no timber harvested. Recreation continues to be heavy at times on the allotment. Illegal ATV trails and use are present throughout the area. A modified "spoke" nested frequency site was installed in 2005. The current permittee had a 25% reduction in numbers for the 2006 and 2007 grazing seasons (from 375 to 281 cow/calf pair). Action was taken due to violations of the Terms and Conditions of the Grazing Permit. Livestock owned by the permittee were found to be grazing in greater numbers or times or places other than permitted. This permittee satisfactorily met the conditions of the action for the 2006 season. The suspension will take affect for the 2007 grazing season as well. Upon successful compliance the permittee will be granted full numbers starting again in the 2008 grazing season. Bootjack C&H Allotment is managed under a single pasture continuous grazing system. One permittee is authorized to graze cattle on the allotment. The number of

livestock permitted to graze is 375 cow/calf pair during a season of 7/11 through 9/1. The allotment consists of approximately 8,601 acres of National Forest Service System Lands. Allotment is currently being analyzed for NEPA with a 2007 decision.

An interdisciplinary BMP review was conducted in 2004 and 2006 (Bootjack Allotment BMP Review, 2004; Bootjack Allotment BMP Review, 2006). These reviews showed that the BMPs are implemented and effective in providing adequate protection of soil and water resources.

Meadow View C&H

This allotment is a small (40 acre) allotment used to graze 4 cow/calf pair for a season long period of 6/16 to 10/15. One permittee is authorized to graze cattle on the allotment. The allotment consists of approximately 48 acres of National Forest Service System lands. This allotment is in the NW corner of the Bootjack C&H Allotment. The District added this allotment into the Bootjack C&H allotment for the 2007 grazing season. Acreage would be added into the Bootjack allotment. Consequently, there will not be any net gain of animals (Aums) nor time allotted for use by this additional 40 acres. Allotment is currently being analyzed for NEPA with a 2007 decision.

Icehouse/Willow S&G

One permittee is currently authorized to graze 1070 sheep from 7/1 to 8/31 (61 days). The permit was renewed in 2002. Permittee took non-use in 2004 and 2005. Permittee grazed sheep in 2006 (7/1-8/31) for a total of 61 days or 429 head months. This allotment is one that will be closed as the situation presents itself for recovery of the grizzly bear and it's habitat in the Centennial Mountains Subsection. Allotment is currently being analyzed for NEPA with a 2008 decision.

Fire and Fuels

Habitat types within the analysis area affect fuel conditions. Douglas-fir is a fire-adapted species. Mature Douglas-fir has thick insulating bark that protects the inner cambium layer of the tree from moderately intense surface fire. Although mature Douglas-fir are resistant to moderate fire, saplings and seedlings are very susceptible due to resin blisters on the photosynthetic bark, low branching habit, close needles and thin bud scales. Due to this susceptibility during the early development, low frequency, low intensity fires have maintained closed stands. Fire can produce a mosaic of size classes and mixed species through less frequent, mixed severity fires.

Age class diversity is limited within the analysis area. Some limited timber management has occurred in the lodgepole pine/Douglas-fir types. Almost no harvest has taken place in the Englemann spruce/subalpine type. Some 99 percent of the conifer forests are in mature or older seral stages. Douglas-fir is becoming more dominant as it encroaches on stands of lodgepole pine and aspen or shrubs. Evidence of insect attack is readily visible in the Douglas-fir type within the analysis area and has been substantiated in the 2002 Aerial Insect Disease Detection Survey conducted by the Forest Service.

Historic photographs from the early 1900's show large aspen stands dominated much of the watershed. Due to suppression of wildfire, this has resulted in an evolution of the fir/pine habitat type. Shade tolerant species such as subalpine fir, Englemann spruce and Douglas-fir, are able to colonize an area due to the absence of fire. These species tend to be more susceptible to insects and disease and colonize quickly to provide large accumulations of horizontally and vertically continuous fuels.

The dominant fire dependant species that thrive in the fire environment are now less vigorous due to the stress placed on them through competition for resources and the introduction of new pathogens to the stand.

Fuels accumulations are steadily increasing and are setting the stage for high intensity, high mortality wildfire. Some plot surveys in the adjacent watershed indicate low tons/acre at this time; however, the stand density and latter fuels will contribute to the rapid fuel loading buildup and increase the danger of large fire events.

Forest structure can be divided into four aspects; age structure, species composition, mosaic patterns and vertical structure or fuel ladders (Kilgor 1981). Each of these aspects can, and in most cases, are modified by fire exclusion. The effects fire suppression has on the structure of the forest directly impacts wildfire, hydrologic function, insects, pathogens and aquatic organisms.

Research in the Selway-Bitterroot Wilderness Area (Barrett and Arno), developed the concept of "fire regimes". Barrett and Arno found that each vegetative community responds to fire, or lack of fire, in similar ways. Habitat types have been grouped together by similar response patterns into the widely accepted fire regimes. A fire regime describes a plant community's expected response to fire. In general, fire regimes give us a description of the type of fire effects that can be expected for different layers of the forest vegetation.

Stand replacement fire, in which the majority of trees are killed, tend to favor seral species while low intensity mixed severity fire would favor shade tolerant species. This is evidenced on the Alpine Fire (in an adjacent watershed) of 2001 where 475 acres of primarily seral lodgepole pine was killed by a fast moving, wind driven fire that quickly spread into the tree canopy through the ladder fuels of shade tolerant trees.

Each fire regime entails three descriptors:

1) Fire type and severity (i.e. lethal, non lethal, mixed-severity).
2) Frequency of return interval (frequent, non-frequent).
3) Burn pattern (mosaic, uniform).

The **four regimes** within the analysis area are described separately:

Lodgepole Pine/ Subalpine Fir (LPP/SAF) Fire Regime – This fire regime generally occurs on cool, dry habitat types at 5000 – 8000 ft. elevations within the analysis area. Within the **llp/saf** fire regime, there are two distinct response patterns to wildfire. A lethal, uniform spread pattern resulting in stand replacement is found in mature lodgepole and subalpine stands. These stands have a fire return interval of 155 years (Barrett 1993). After a stand replacement fire, lodgepole pine will dominate, with Englemann spruce, Douglas-fir, and whitebark pine present to a lesser extent due to elevation. Subalpine fir will eventually dominate the site in late seral stands. On drier, less-steep sites with lodgepole pine, "understory burning" in the form of non-lethal/non-uniform spread patterns may occur. The less intense surface fire consumes the fine fuels without causing extensive mortality to the trees.

Douglas-fir/Subalpine Fir/Englemann Spruce (DF/SAF/ES) Fire Regime – This regime occurs on cool, moist northerly aspects, usually at higher elevations (5000 ft and >). Due to the high elevation and lower energy aspects, these sites generally do not dry out until late summer. Uniform, stand replacement fires are typical, however a mosaic pattern, leaving stands or whole groups of live trees often occurs. These stands are a result of fuel accumulations and continuous ladder-fuels over 190 year intervals (Barrett 1993). Mature stands have higher fuel accumulations and more continuous ladder fuels within the stand structure. Fires, once started, produce higher intensities resulting in higher tree mortality, mainly as a stand replacement event. Seral species such as Douglas-fir, Englemann spruce, and subalpine fir become a major component as the lodgepole pine die-out after 160 years of age.

Quaking Aspen (ASP) Fire Regime – Quaking aspen is the most widely distributed native North America tree species (Little 1971, Sargent 1890). It grows in a great diversity of regions, environments and communities. Aspen is a component of several vegetation types within the watershed. It grows in a broad range of elevations from 5500 feet to 8000 feet.
Due to climatic conditions throughout the analysis area, the aspen sites rarely have an opportunity to burn naturally. Prescribed burning in the Current Creek area was attempted on several instances in the spring with marginal results. The combination of dry weather and cured fuels within the aspen forest does not occur every year. Most frequently, it occurs in the autumn, sometimes in late summer, and occasionally in spring. Late September and October can be wet, but often have periods of dry, sunny weather. At this time, the herbaceous understory has frozen and is dead, but still largely upright, and can burn readily. The aspen canopy also loses its leaves in late September and October. If conditions continue to dry, layers of continuous, loosely packed fine fuels develop, making the aspen more flammable. Most years however, aspen leaf-fall and the first heavy wet snow of autumn coincide in much of the aspen range.

Uniform stand replacement fires are not typical for this regime; however, a mosaic burn pattern leaving stands or whole groups of live trees often happens. More often, the result is that the perimeter of the aspen stand is burned due to adjacent fuel such as grass, mountain brush, and sagebrush.

Soil moisture within the stand is also a contributing factor for the fires difficulty in burning through the stand. Although aspen does not burn readily, aspen trees are extremely sensitive to fire because of their thin bark. Despite the difficulty of getting fire to burn through aspen stands, the sensitivity of the species, especially that of young trees, makes prescribed fire a viable tool for regenerating aspen. A fire intense enough to kill the aspen over-story stimulates abundant suckering; however, some suckering occurs after any fire disturbance. Low to moderate fire intensity will reduce the fuel load on the ground but may not be hot enough to remove the over-story in the stand.

Aspen require regular disturbances, such as fire, a wind event strong enough to up-root the trees, or mechanical treatment to assure regeneration of the stand. Without such an event, conifers, shrubs, and or grass displace aspen. Once the invasion of conifers starts, aspen are out-competed by the conifers for moisture and the aspen begin to die. Stephen W. Barrett suggests the following fire frequency intervals in forest stands of conifer and aspen to have a range from 16 to 97 years and the average mean fire interval of 45 years (S.W. Barrett, Final Report, Fire Regimes on the Caribou/Targhee National Forest, 9/94, 25 pp).

Human Uses

The advancement of technology in motorized recreation vehicles has allowed users to access areas with the watershed that they were unable to access in the past. Many open areas, such as meadows, are used extensively by snowmobilers. Use of ATV's has also increased dramatically, and non-system trails have become a resource concern (Figure 109, Figure 110).

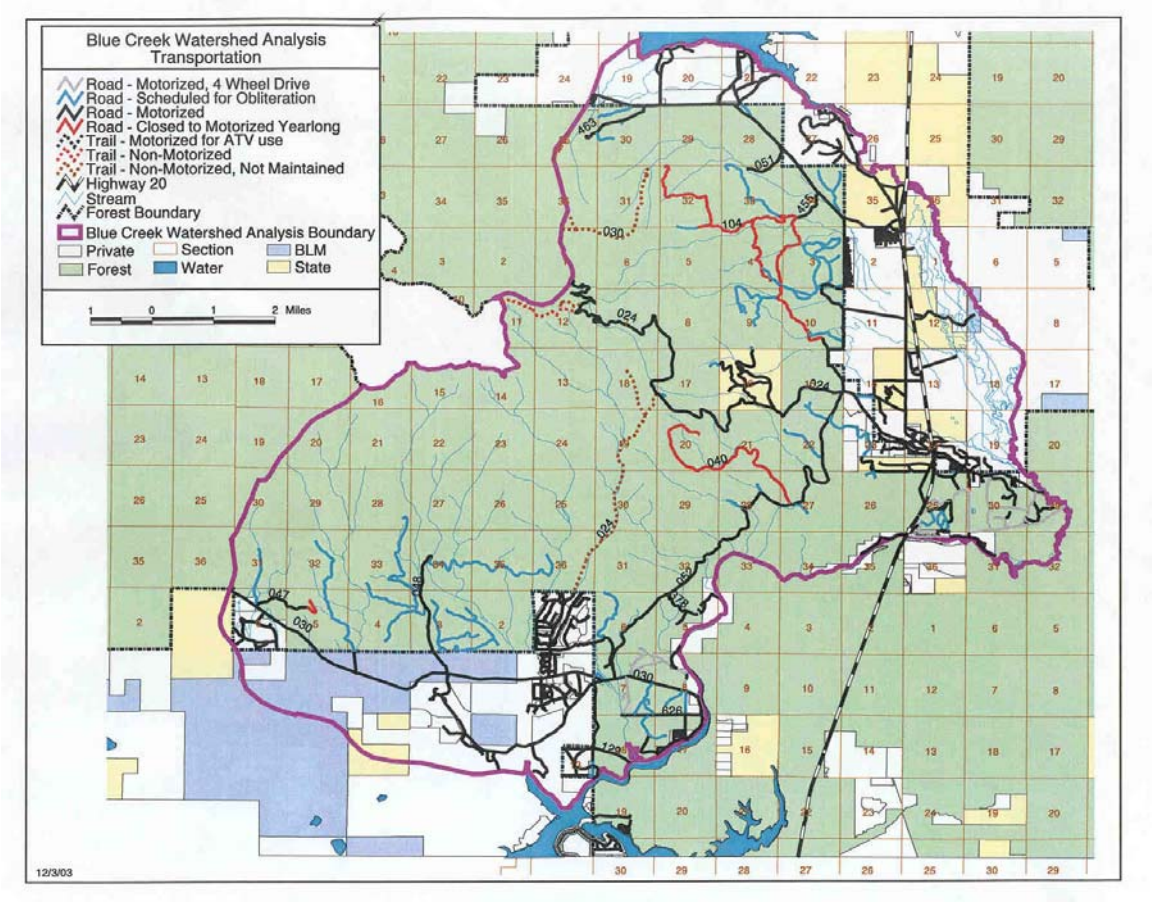


Figure 109 Transportation map of the Blue Creek analysis area.

Figure 110 Resource damage from illegal ATV use in the Bootjack area.

Many of the dispersed camping areas are heavily used, especially those in the Boot Jack area. Many of these sites have significant amounts of bare ground.

Requests are being made for additional use at Sawtell Communication site.